The Revolution in Military Affairs & the Supporting U.S. Department of Defense Modeling & Simulation Strategy

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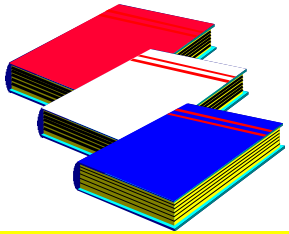
Two Revolutions Are Occurring in DoD

1997: 3 Major DoD Documents



QDR
DRI
NDP

Common reform principles

- Focus enterprise on unifying vision
- Commit ldrship team to change
- Focus on core competencies
- Streamline orgs for agility
- Invest in people
- Breakdown barriers between orgs
- Exploit info technology

QDR Quadrennial Defense Review
DRI Defense Reform Initiative
NDP National Defense Panel

What we Buy - Revolution in Military Affairs

- **Build on new warfighting concepts of Joint Vision 2010**
- **Exploit technology to achieve**

How we Buy - Revolution in Business Affairs

- **Take advantage of Business process improvements pioneered in private sector**
- **A must, to maintain competitive edge in a changing global security arena**

M&S is Critical to DoD's Ability to Meet its Mission

Continuing squeeze on DoD resources

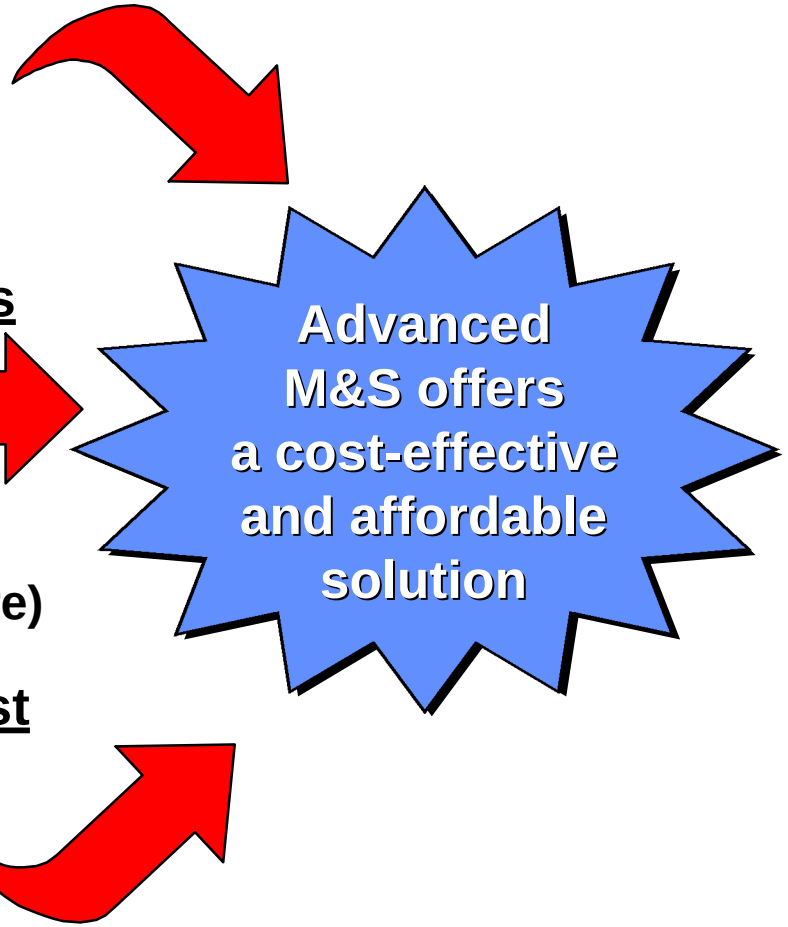
- shrinking, dispersed force structure
- competition for funds limits field exercises
- need to carefully examine every investment

More demanding operational requirements

- new, more complex missions
- vastly expanding mission space
- increased complexity of systems and plans
- increasing demand for joint training
- security challenges (e.g., information warfare)

Much more technical capability at less cost

- communications
- computers
- software technology
- displays/human-machine interfaces
- data storage and management



DoD M&S Vision

DoD Executive Council for Modeling and Simulation (EXCIMS), March 13, 1992

Defense modeling and simulation will provide readily-available, operationally-valid environments for use by DoD components

- **to train jointly, develop doctrine and tactics, formulate operational plans, and assess war fighting situations**
- **as well as to support technology assessment, system upgrade, prototype and full scale development, and force structuring.**

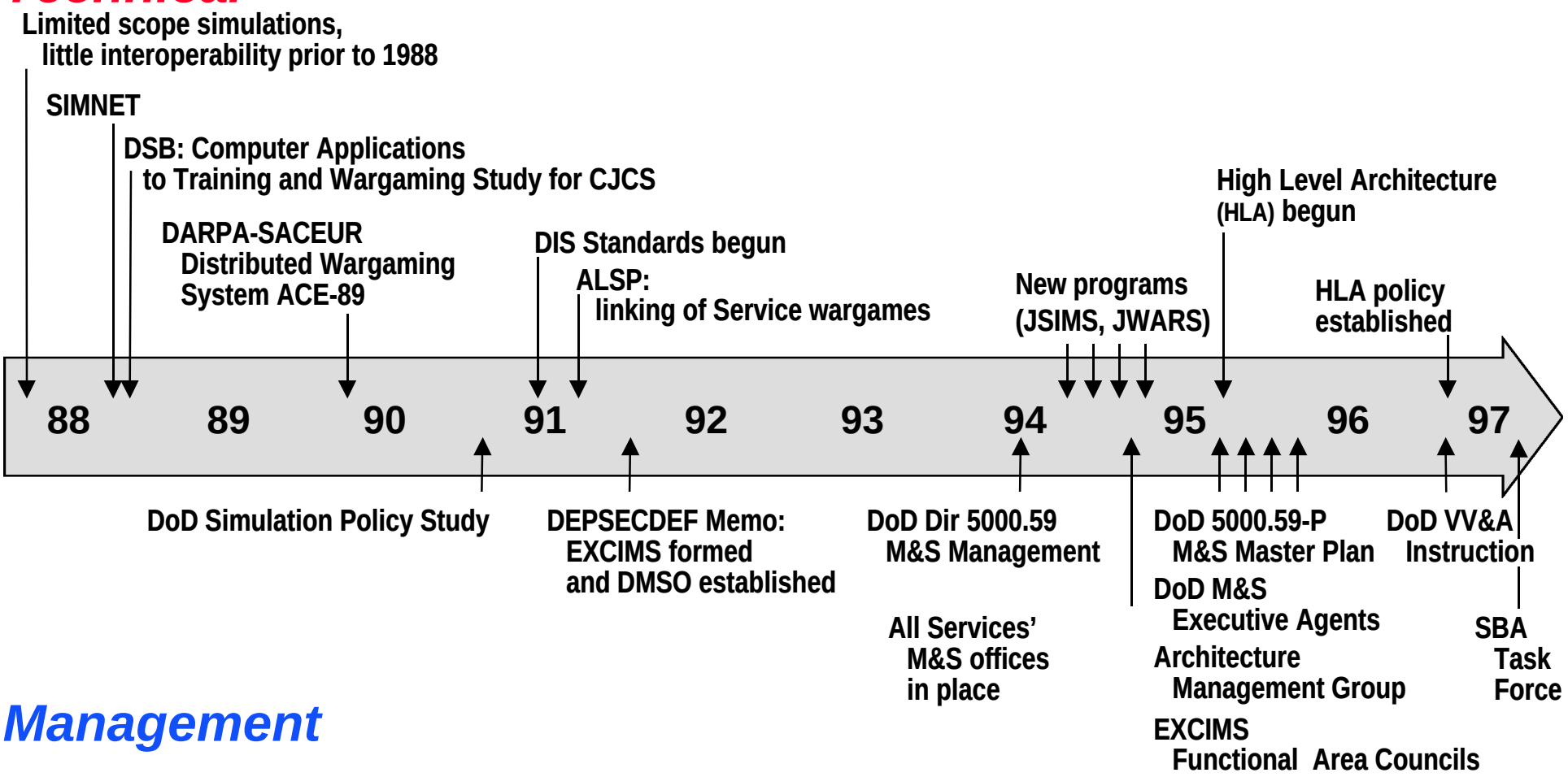
Furthermore, common use of these environments will promote a closer interaction between the operations and acquisition communities in carrying out their respective responsibilities. To allow maximum utility and flexibility, these modeling and simulation environments will be constructed from affordable, reusable components interoperating through an open systems architecture.

Requires a "systems of systems" approach

Recent DoD M&S History

Technical progress spurs management response

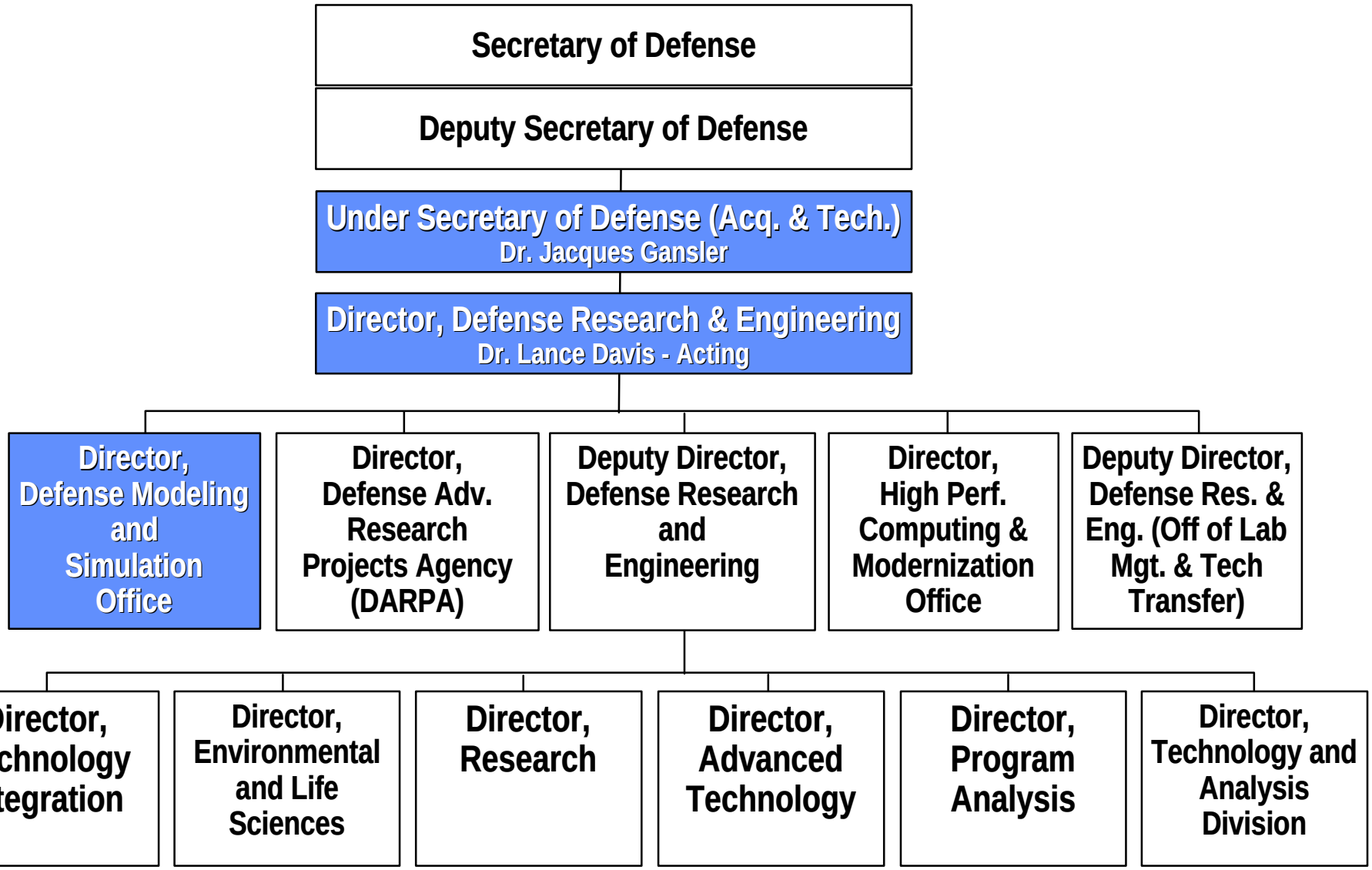
Technical



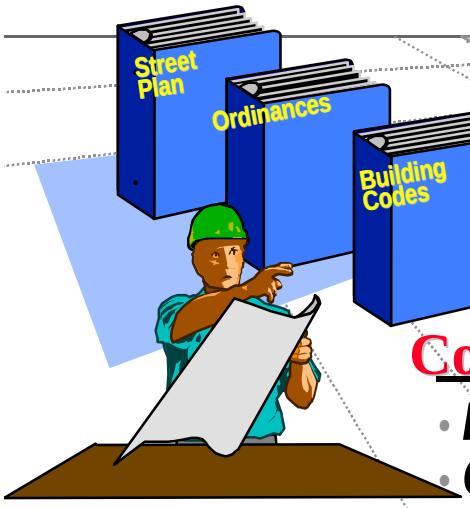
Management

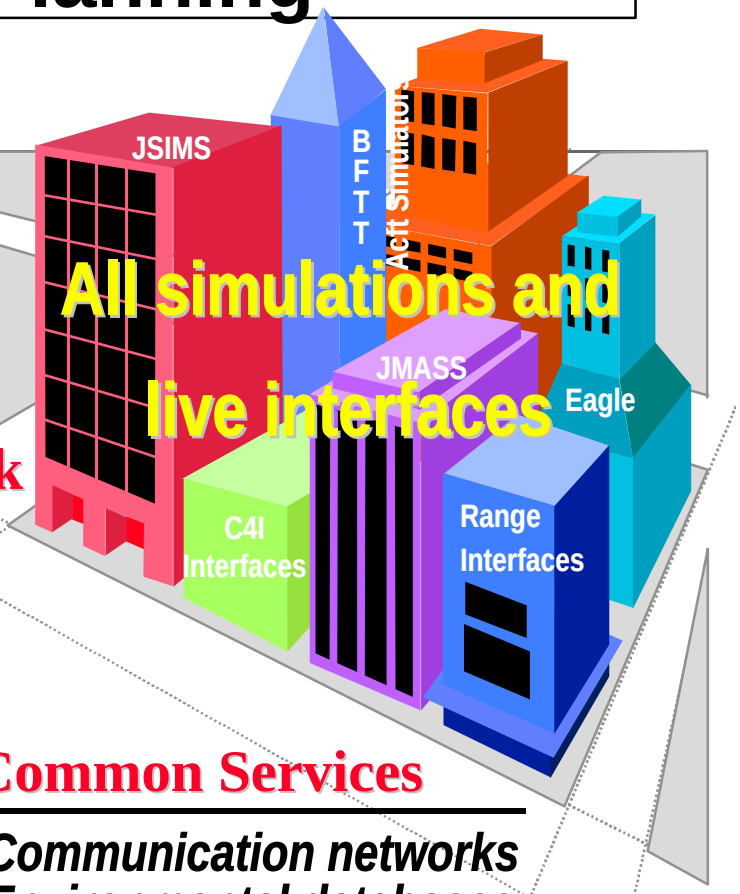
No formal management structure / Management structure stand-up / Management structure in place

Where DMSO Fits



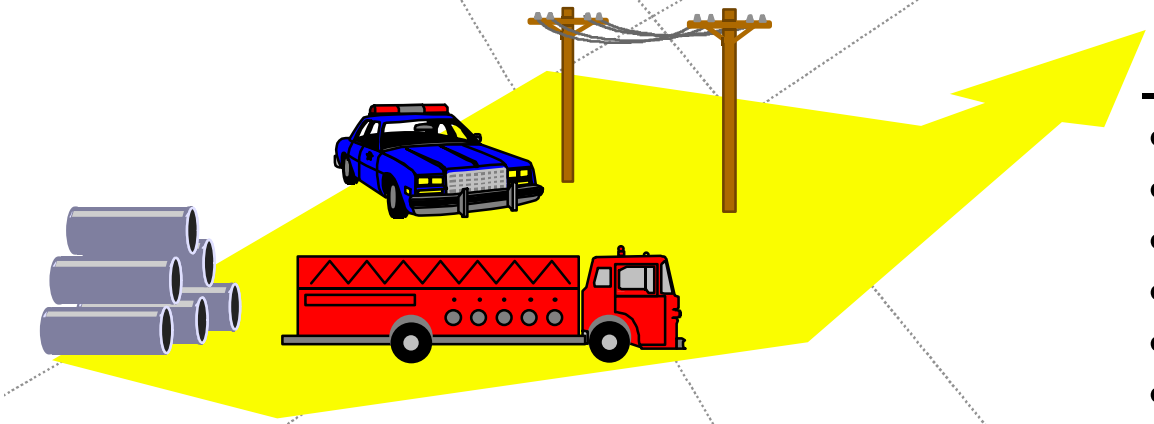
DoD M&S Strategy: An Analogy to City Planning





Common Technical Framework

- *High Level Architecture*
- *CMMS (common world view)*
- *Data Standards*



Common Services

- *Communication networks*
- *Environmental databases*
- *Resource repositories*
- *VV&A policy and procedures*
- *Help Desks (IAC & MSOSA)*
- *Supporting software/tools*

Payoffs: Interoperability and reuse = capability and cost-effectiveness

The Strategy Is Being Executed Through a DoD-wide M&S Master Plan

Objective 1	*Objective 2*	*Objective 3*	*Objective 4*	*Objective 5*	*Objective 6*
Develop a common technical framework for M&S	Provide timely and authoritative representations of the natural environment	Provide authoritative representations of systems	Provide authoritative representations of human behavior	Establish an M&S infrastructure to meet developer and end-user needs	Share the benefits of M&S
Sub-objectives	***Sub-objectives***		***Sub-objectives***	***Sub-objectives***	***Sub-objectives***
1-1 High-level architecture	2-1 Terrain		4-1 Individuals	5-1 Field systems	6-1 Quantify impact
1-2 Conceptual models of the mission space	2-2 Oceans		4-2 Groups and organizations	5-2 VV&A	6-2 Education
1-3 Data standardization	2-3 Atmosphere			5-3 Repositories	6-3 Dual-use
	2-4 Space			5-4 Communications	
				5-5 Coordination Center	

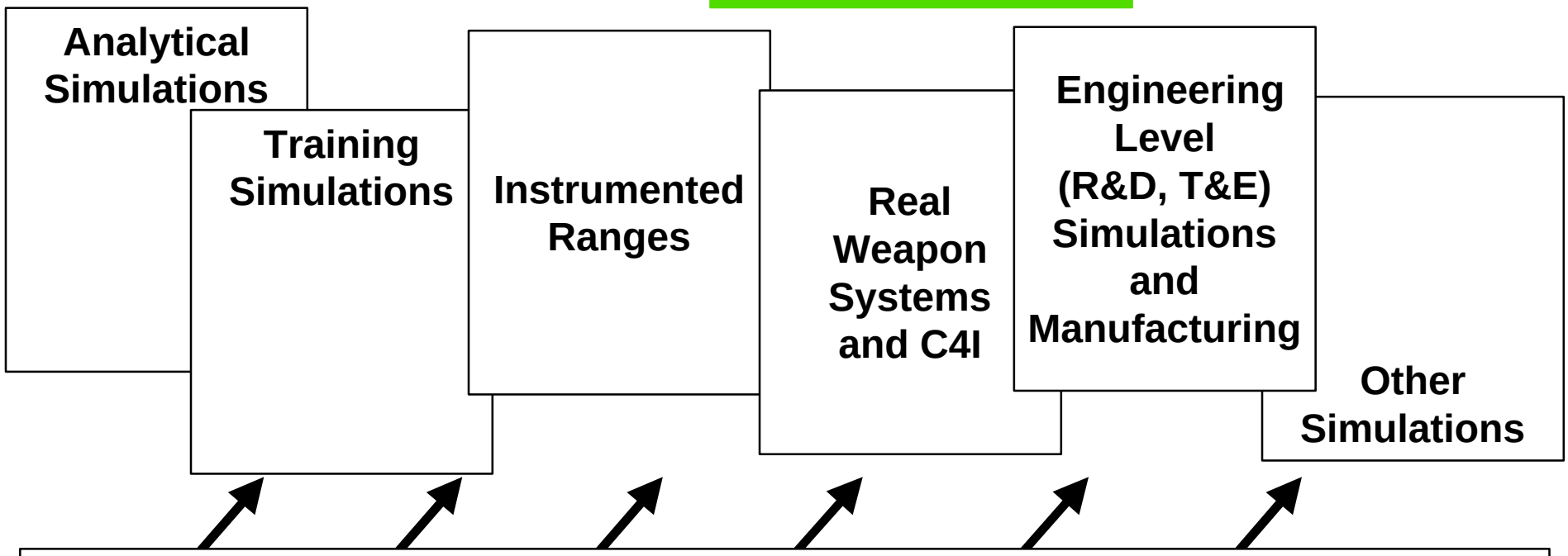
DoD 5000.59-P, Modeling and Simulation Master Plan, October 1995

Diverse Simulation Applications under an Overarching Technical Framework

Master Plan's Technical Framework

High Level Architecture, Conceptual Models of the Mission Space, Data Standards

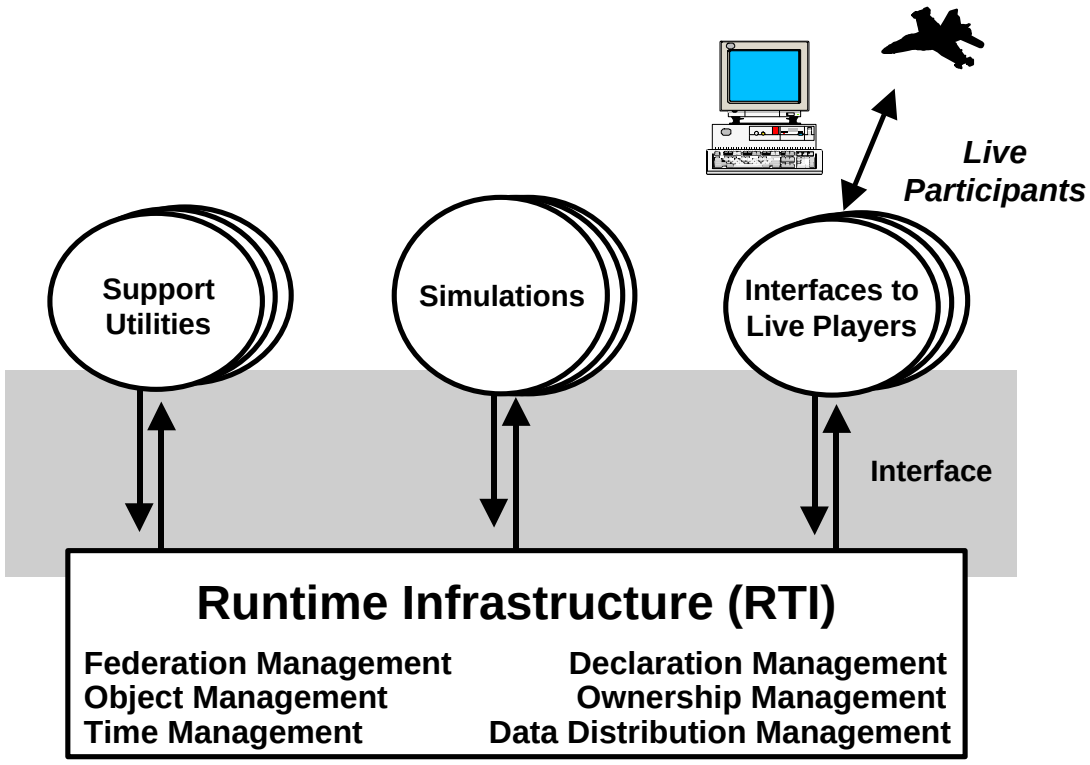
Domain-specific aspects



Technology Development

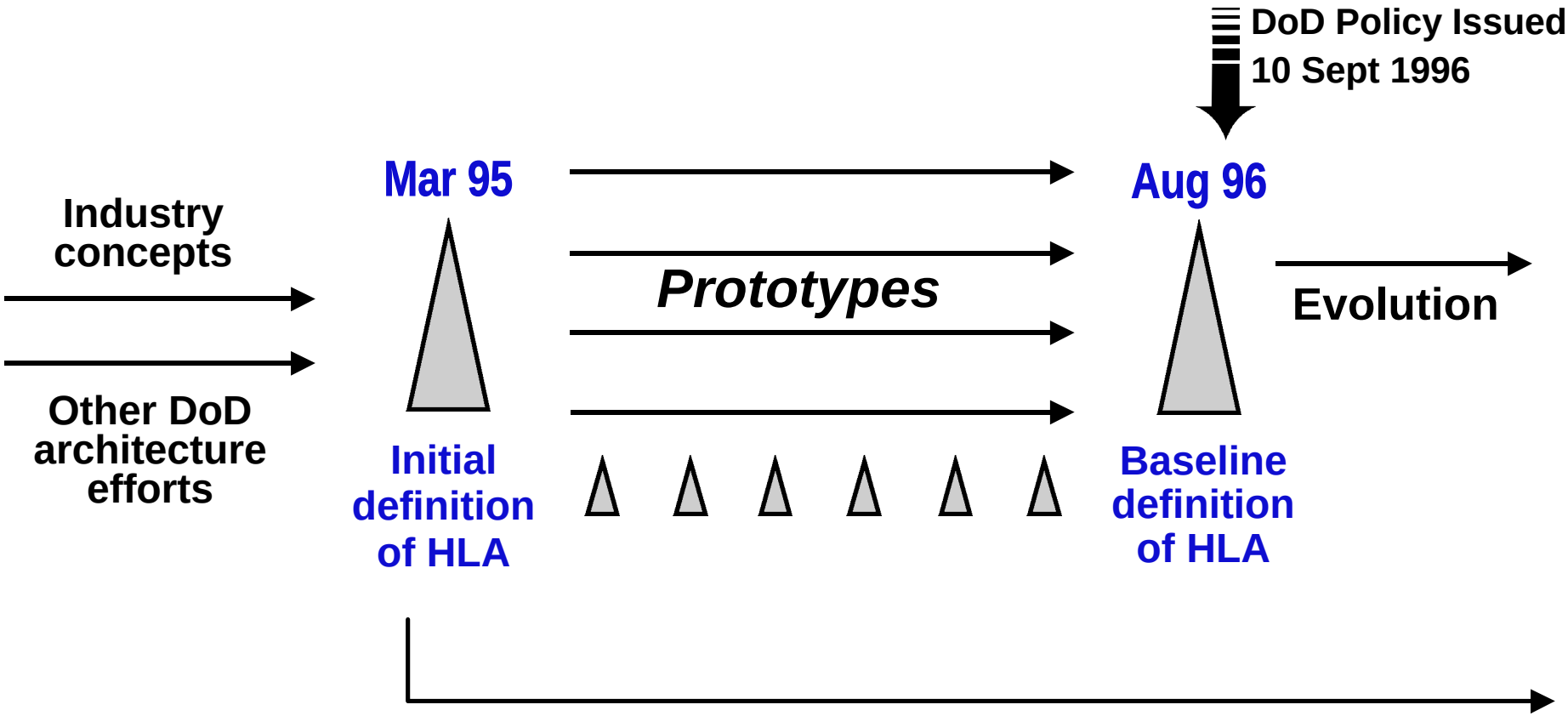
The High Level Architecture

- **Architecture calls for the federation of simulations**
- **Architecture specifies**
  - **Ten rules**
    - **define relationships among federation components**
  - **Object Model Template**
    - **specifies the form in which simulation elements are described**
  - **Interface Specification**
    - **describes the ways simulations interact during an operation**



HLA satisfies the most important consideration for interoperability and reuse, but it is not a "magic wand." Careful planning is still required.

High Level Architecture (HLA) Development Process Overview



DoD-wide Architecture Management Group

(16 major simulation programs; developers were 35% government, 12% FFRDC, 5% academia, 48% industry)

DoD HLA Policy

- **DoD Policy**

"Under the authority of [DoD Directive 5000.59], and as prescribed by [the DoD Modeling and Simulation Master Plan], I designate the High Level Architecture as the standard technical architecture for all DoD simulations."

- **HLA supersedes Distributed Interactive Simulation (DIS) and ALSP**
- **"No Can" deadlines**
  - **"No Can Pay"- first day of FY99**
    - **no funds for developing/modifying non-HLA-compliant simulations**
  - **"No Can Play"- first day of FY01**
    - **retirement of non-HLA-compliant simulations**
- **Waivers must be decided on a corporate basis**

Dr. Paul Kaminski, USD(A&T)
10 September 1996

DoD HLA Policy Reaffirmation

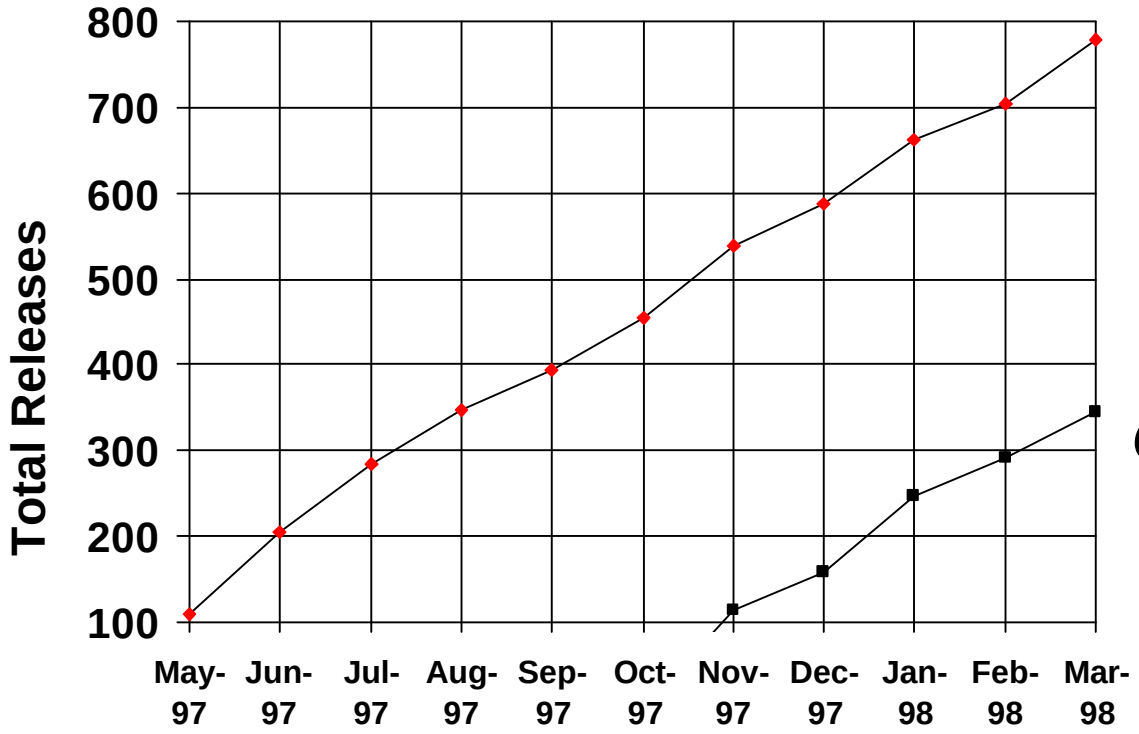
DoD Transition Policy

"We must foster broad simulation interoperability and reuse if the Department is to cost-effectively harness the potential of simulation to improve DoD operations."

"All new simulations will be built in accordance with the HLA. To reap the full benefits of simulation interoperability and reuse in the near-term, it is also important to quickly transition our legacy simulations to the HLA, … I encourage our industry partners to follow suit"

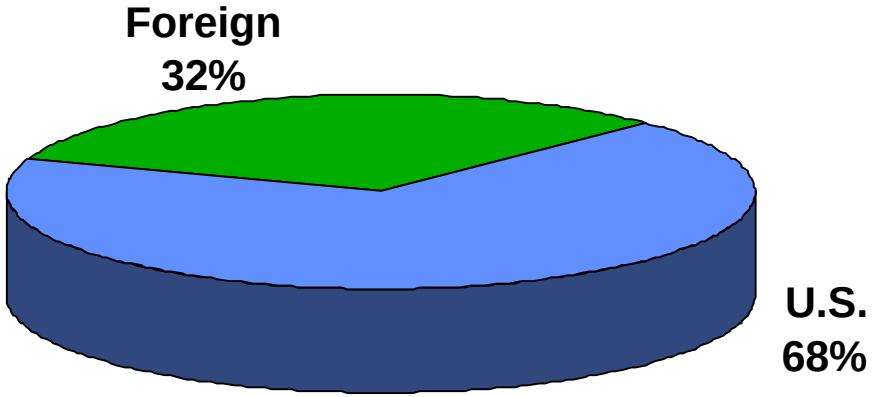
Dr. J.S. Gansler, USD(A&T)
7 April 1998

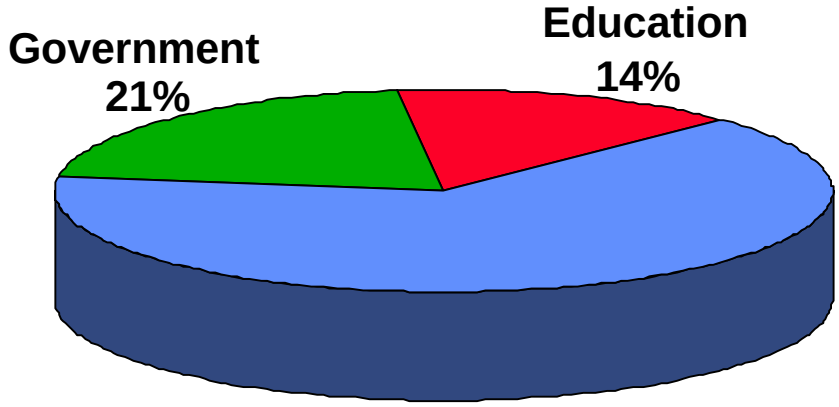
HLA Software Releases
through March 1998



RTI - 779

OM Tools - 346





HLA Transition Support

- **HLA is evolving smartly under the AMG, with the right players involved**
- **A comprehensive suite of supporting software is being distributed, in the public domain, with full documentation and technical support**
  - **Runtime Infrastructure, Object Model Development Tool, Object Model Data Dictionary, Object Model Library**
  - **over 1100 copies of these tools, across the U.S. and internationally**
- **All HLA information is available in the public domain, and COTS products are emerging**
- **A comprehensive education and outreach program is underway**
  - **25 classes, 843 people trained thus far; active in numerous forums**
- **HLA is being established as an IEEE standard and adopted by NATO**
  - **yielding more reusable products, a stronger industrial base and more opportunities for international cooperation**
- **User-friendly compliance testing capability is in place**

Some Other Key Corporate Activities

- **Data interchange standards**
  - **run-time (HLA data dictionary), knowledge acquisition, and initialization (e.g., terrain, order of battle)**
  - **coordinated with larger DoD data effort**
- **Sharing real-world knowledge (raw materials)**
- **M&S Executive Agents for Terrain; Air and Space; Oceans; Foreign Forces and US National/Joint Intel**
- **Repository system to share reusable resources**
- **Help desks to aid developers, users and managers**
- **Verification, validation and accreditation policy and procedures**
- **Human behavioral representation research**
- **Pursuit of dual use (standards, entertainment industry, allies)**
- **Education**

Sponsor/Developer/Industry Perspective